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EXAMINER

ZHU, WEIPING

ART UNIT

PAPER NUMBER

1734

NOTIFICATION DATE

DELIVERY MODE

08/04/2011

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docketing@howsonandhowson.com

| | | | |
|------------------------------|--------------------------------------|-------------------------------------|--|
| Office Action Summary | Application No. 10/566,116 | Applicant(s) INOUE ET AL. | |
| | Examiner WEIPING ZHU | Art Unit 1734 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 May 2011.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2,3,14,20-25 and 37-44 is/are pending in the application.
- 4a) Of the above claim(s) 21-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2, 3, 14, 20 and 37-44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Status of Claims

1. Claims 2, 3, 14, 20 and 37-44 are currently under examination, wherein no claim has been amended in applicant's amendment filed on May 17, 2011.

Status of Previous Rejections

2. The previous rejections of claims 2, 3, 14, 20 and 37-44 under 35 U.S.C. 103(a) as stated in the Office action dated January 20, 2011 are maintained as follows:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 2, 3, 14, 20, 37, 38 and 42-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. ("Deformation Behavior of Zr-Based Bulk Nanocrystalline Amorphous Alloys", Physical Review B, volume 61, number 6, R3761-R3763, February 1, 2000-II) in view of Nate et al. (US 4,992,059).

With respect to claims 2, 3, 14, 20, 37 and 38, Fan et al. discloses (abstract) a Zr-based bulk nanocrystalline amorphous alloy $\text{Zr}_{53}\text{Ti}_{15}\text{Ni}_{10}\text{Cu}_{20}\text{Al}_{12}$ having an average grain size range of 2.0-2.5 nm being uniform entirely throughout the specimen (Fan et al., the paragraph bridging the left and right columns and Fig. 2, page R3762), which overlaps the claimed ranges in the instant claim 2, 3, 37 and 38; having a three or more component system and more than 50 at% of Zr as claimed in the instant claims 2 and

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37; and having at least one element selected from a group consisting of Cu, Ni and Al as claimed in the instant claims 14, 20 and 37. The Zr-based bulk nanocrystalline amorphous alloy of Fan et al. is a bulk amorphous metallic glass satisfying the requirements of atomic radius difference and negative heat of mixing as claimed in the instant claims 2 and 37.

With respect to claims 2 and 37, Fan et al. does not teach producing a sputtering target from the bulk amorphous metallic glass.

Nate et al. ('095) discloses amorphous materials can be formed into sputtering targets by sintering powders of desired compositions (col. 1, lines 18-35 and col. 2, line 31 - col. 4, line 68).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the bulk metallic glass material produced in the process of Fan et al. into a sputtering target by sintering the bulk metallic glass material in powder form as disclosed by Nate et al. ('095) in order to deposit on a substrate a thin film of desired composition and structure as disclosed by Nate et al. ('095) (col. 1, lines 25-28).

With respect to claims 2 and 37, Nate et al. ('095) discloses that the diameter of the sputtering target is 151 mm (col. 5, lines 35-43), which is within the claimed range. A prima facie case of obviousness exists. See MPEP 2144.05 I.

With respect to claims 2 and 37, Fan et al. in view of Nate et al. ('095) does not disclose the sputtering target being made of sintered gas-atomized powder as claimed. However, "being made of sintered gas-atomized powder" is a process limitation in a product claim. Even though product claims are limited by and defined by the process,

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determination of patentability is based on the product itself. Fan et al. in view of Nate et al. ('095) disclose a sputtering target comprising an amorphous metallic glass, which reasonably appear to be only slightly different than the claimed metallic glass in the instant claims 2 and 37 as discussed above. A rejection based on section 103 of the status is eminently fair and acceptable. See MPEP 2113.

With respect to claims 2 and 37, Fan et al. in view of Nate et al. ('095) does not specify the density of the sputtering target. However, it has been well held where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established. In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977), MPEP 2112.01 [R-3] I. In the instant case, the claimed and Fan et al. in view of Nate et al. ('095)'s sputtering targets are identical or substantially identical in structure or composition and are produced by identical or substantially identical processes as discussed above, therefore a prima facie case of obviousness exists. The same density as claimed in the instant claims 2 and 37 would be expected in the sputtering target of Fan et al. in view of Nate et al. ('095) as in the claimed sputtering target.

With respect to the amended features in claims 2 and 37, Fan et al. discloses (abstract) a Zr-based bulk nanocrystalline amorphous alloys comprising fine crystals having an average grain size range of 2.0-2.5 nm being uniform entirely throughout the amorphous matrix (paragraph bridging the left and right columns and Fig. 2, page R3762). The average grain size of the fine crystals disclosed by Fan et al. overlaps the

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instantly claimed average crystallite size. The fine crystals or fine crystal grains disclosed by Fan et al. appear to be the same as the instantly claimed crystallites because crystallites are often referred by metallurgists as grains. The Zr-based bulk nanocrystalline amorphous alloy of Fan et al. is completely amorphous with uniformly dispersed fine crystal grains (paragraph bridging the left and right columns and Fig. 2, page R3762), which meet all the limitations of the entire amorphous structure with uniformly dispersed crystallites as claimed in the instant claims 2 and 37. Therefore, grain boundaries would not be observable and there would be no crystal growth in the sputtering target of Fan et al. in view of Nate et al. ('095) as in the instantly claimed sputtering target.

With respect to claim 42, the Ni, Cu and Al contents in the sintered body target structure of a Zr-based bulk nanocrystalline amorphous alloy $\text{Zr}_{53}\text{Ti}_5\text{Ni}_{10}\text{Cu}_{20}\text{Al}_{12}$ of Fan et al. in view of Nate et al. ('095) are 5 at.% or more.

With respect to claim 43, the sintering temperature limitation is a process limitation in a product claim. Even though product claims are limited by and defined by the process, determination of patentability is based on the product itself. Fan et al. disclose an amorphous metallic glass (abstract), which reasonably appear to be only slightly different than the claimed metallic glass in the instant claim 37. A rejection based on section 103 of the status is eminently fair and acceptable. See MPEP 2113.

With respect to claims 44, Fan et al. in view of Nate et al. ('095) does not specify the claimed surface roughness of the metallic glass sputtering target after sputtering is performed. However, it has been well held where the claimed and prior art products are

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identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established. In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977), MPEP 2112.01 [R-3] I. In the instant case, the claimed and Fan et al. in view of Nate et al. ('095)'s sputtering targets are identical or substantially identical in structure or composition and are produced by identical or substantially identical processes as discussed above, therefore a prima facie case of obviousness exists. The same roughness as claimed in the instant claim 44 would be expected in the sputtering target of Fan et al. in view of Nate et al. ('095) as in the claimed sputtering target.

4. Claims 39-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. in view of Nate et al. ('095) as applied to claims 2 and 37 above and further in view of Kakiuchi et al. ("Application of Zr-Based Bulk Glassy Alloys to Golf Clubs", Materials Transactions, Vol. 4, No. 4 (2001) pp. 678 to 681).

With respect to claims 39 and 40, Fan et al. in view of Nate et al. ('095) does not disclose the claimed metallic glass. Kakiuchi et al. discloses that Zr-Al-Ni-Cu and Zr-Ti-Al-Ni-Cu metallic glassy alloys have been principle materials for basic research and application studies and that the metallic glassy alloys of $Zr_{60}Al_{10}Ni_{10}Cu_{20}$, which is close to the claimed $Zr_{65}Cu_{17.5}Ni_{10}Al_{7.5}$, and $Zr_{58}Ti_2Al_{10}Ni_{10}Cu_{12}$, which is close to the $Zr_{53}Ti_5Ni_{10}Cu_{20}Al_{12}$ of Fan et al. in view of Nate et al. ('095), have similar properties (sections 1 and 2, pages 678 and 679). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the $Zr_{53}Ti_5Ni_{10}Cu_{20}Al_{12}$ of Fan et al. in view of Nate et al. ('095) with the claimed

$\text{Zr}_{65}\text{Cu}_{17.5}\text{Ni}_{10}\text{Al}_{7.5}$ to form a sputtering target with an expectation of success, because these metallic glassy alloys are functionally equivalent as disclosed by Kakiuchi et al.. See MPEP 2144.06.

With respect to claim 41, Fan et al. in view of Nate et al. ('095) and further in view of Kakiuchi et al. discloses that the content of Zr in the sintered body target structure of a Zr-based bulk nanocrystalline amorphous alloy $\text{Zr}_{60}\text{Al}_{10}\text{Ni}_{10}\text{Cu}_{20}$ is 60 at.%, which is close to the claimed lowest content of 65 at.%.

Response to Arguments

5. The applicant's arguments filed on May 17, 2011 have been fully considered but they are not persuasive.

First, the applicant argues that "powder grains" (i.e. gas atomized powder of amorphous metallic glass) are not and cannot exist within the structure of the cast samples disclosed by Fan et al. In response, the examiner notes that there is no recitation of the "powder grains" or gas atomized powder in the sintered body target structure as claimed in the instant claims 2 and 37. The instantly claimed crystallites in the sintered body target structure are the same as the fine crystal grains of Fan et al.. The completely amorphous nanocrystalline alloy having uniformly dispersed fine crystal grains as disclosed by Fan et al. clearly satisfies all the limitations of the entire amorphous structure with uniformly dispersed crystallites as claimed in the instant claims 2 and 37 as discussed above.

Second, the applicant argues that Fan et al. clearly does not teach, suggest or disclose a method of producing a sputtering target based on the sintering method of the

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instant invention nor does Fan et al. teach or enable the physical properties that are produced thereby. In response, the examiner notes that "being made of sintered gas-atomized powder" is a process limitation in a product claim and Nate et al. ('095) discloses amorphous materials can be formed into sputtering targets by sintering powders of desired compositions (col. 1, lines 18-35 and col. 2, line 31 - col. 4, line 68) as disclosed as discussed above. The claimed and Fan et al. in view of Nate et al. ('095)'s sputtering targets are identical or substantially identical in structure or composition and are produced by identical or substantially identical processes as discussed above, therefore a prima facie case of obviousness exists. See MPEP 2112.01 [R-3] I. The same physical properties as instantly claimed would be expected in the sputtering target of Fan et al. in view of Nate et al. ('095) as in the claimed sputtering target.

Third, the applicant argues that the sample of Fan et al. contains plastic strains and shear bands; would not provide the "uniform structure" required by the instant claims; and these defects would render the material commercially useless as a sputtering target. In response, the examiner notes that Fan et al. discloses (abstract) a Zr-based bulk nanocrystalline amorphous alloy $Zr_{53}Ti_5Ni_{10}Cu_{20}Al_{12}$ having an average grain size range of 2.0-2.5 nm being uniform entirely throughout the specimen (Fan et al., the paragraph bridging the left and right columns and Fig. 2, page R3762), which satisfies the structural and compositional limitations as claimed in the instant claims 2 and 37 as discussed above. Furthermore, there is no recitation of plastic strains and shear bands in the instant claims 2 and 37. The argument of the counsel that plastic

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strains and shear bands observed in Fan et al.'s samples are defects cannot be relied upon as evidence. See MPEP 2145 [R-6].

Fourth, the applicant argues that there is no teaching or suggestion provided by Nate et al. ('095) that the structure of the sputtering target itself is amorphous. In response, the examiner notes that Nate et al. ('095) discloses a thin film of amorphous materials made by sputtering a sputtering target formed by sintering powders of desired compositions (col. 1, lines 11-35 and col. 2, line 31 - col. 4, line 68). Nate et al. ('095) further discloses that the composition and structure of a film deposited by sputtering a sputtering target would be similar to the composition and structure of the sputtering target (col. 1, lines 49 to col. 2 line 31) indicating that the structure of the sputtering target itself would be amorphous in order to make a thin film of amorphous materials by sputtering the sputtering target.

Fifth, the applicant argues that both the structure and the composition of the target taught by Nate et al. ('095) are completely different to those of the instant invention. In response, see the examiner's response to applicant's 4th argument above. The structures in the sputtering target disclosed by Nate et al. ('095) include alloys of rare earth elements and transition metals which are amorphous. Furthermore, the ground of rejection of the claimed composition and structure of the Zr-based bulk nanocrystalline amorphous alloy relies on the teaching of Fan et al. rather than that of Nate et al. ('095). It is noted that the appellant is arguing against the references individually, whereas, the obvious rejection relies on the combined teachings of Fan et al. in view of Nate et al. ('095).

Sixth, the applicant argues that the technical fields of Fan et al. and Nate et al. ('095) are clearly different; the objects and usage of the teachings of Fan et al. and Nate et al. ('095) are entirely different from those of the instant invention; and Nate et al. ('095) teaches away from the material discussed in Fan et al.; therefore, the combination of Fan et al. and Nate et al. ('095) is improper. In response, the examiner notes that Fan et al. teaches a Zr-based bulk nanocrystalline amorphous alloy and Nate et al. ('095) discloses amorphous materials can be formed into sputtering targets by sintering powders of desired compositions as discussed above. The combination of Fan et al. and Nate et al. ('095) with a motivation to form a bulk metallic glass material of Fan et al. into a sputtering target by sintering the bulk metallic glass material in powder form for depositing on a substrate a thin film of the bulk metallic glass material is proper and maintained. The motivation of Fan et al. in view of Nate et al. ('095) does not have to be the same as that of the instant invention. See MPEP 2144 [R-5]. Furthermore, Nate et al. ('095) does not teach away from the Zr-based bulk nanocrystalline amorphous alloy disclosed by Fan et al. as asserted by the applicant at all.

Seventh, the applicant argues that examiner's interpretation of the teaching of Nate et al. ('095) as being applicable to any desired composition is improper. In response, the examiner notes his position that the teaching of Nate et al. ('095) that amorphous materials can be formed into sputtering targets by sintering powders of desired compositions would at least be applicable to the Zr-based bulk nanocrystalline amorphous alloy disclosed by Fan et al. is proper and therefore maintained.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Weiping Zhu whose telephone number is 571-272-6725. The examiner can normally be reached on 8:30-16:30 Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Emily Le can be reached on 571-272-0903. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Weiping Zhu/
Examiner, Art Unit 1734

/Emily M Le/
Supervisory Patent Examiner, Art Unit 1734
7/18/2011